IN THE CLAIMS

The claims have not been amended herein, but are provided for the Examiner's convenience.

1-16. (Canceled)

17. (Previously Presented) A process comprising:

forming a metallization;

forming a refractory metal first layer over the metallization;

forming a refractory metal second layer over the refractory metal first layer;

forming a refractory metal third layer above and on the refractory metal second layer, wherein the refractory metal third layer is substantially the same metal as the refractory metal first layer;

forming a refractory metal fourth layer above and on the refractory metal third layer, wherein the refractory metal fourth layer is substantially the same metal as the refractory metal second layer; and

forming an electrically connective bump above the refractory metal fourth layer.

18. (Original) The process according to claim 17, wherein forming a metallization comprises:

forming a copper metallization pad over a substrate, wherein the copper metallization pad makes contact with a metallization selected from a range of metal-one (M1) to M6.

19. (Original) The process according to claim 17, wherein forming a refractory metal first layer over the metallization comprises:

depositing the refractory metal first layer by physical vapor deposition of a composition selected from Ni, Co, Pd, Pt, Ti, Zr, Hf, Cr, Mo, W, Sc, Y, La, and Ce.

20. (Withdrawn) The process according to claim 17, wherein forming a refractory metal first layer over the metallization comprises:

sputtering Ti over the metallization to a thickness in a range from about 500 Å to about 2,000 Å.

21. (Original) The process according to claim 17, wherein forming a refractory metal second layer over the refractory metal first layer comprises:

depositing the refractory metal second layer by physical vapor deposition of a composition selected from Ni, Co, Pd, Pt, NiV, CoV, PdV, PtV, Ti, Zr, Hf, Cr, Mo, W, Sc, Y, La, and Ce in a solid-solution or stoichiometric ratio.

22. (Withdrawn) The process according to claim 17, wherein forming a refractory metal second layer over the refractory metal first layer comprises:

sputtering NiV over the refractory metal first layer to a thickness in a range from about 1,000 Å to about 4,000 Å.

23. (Original) The process according to claim 17, wherein forming a refractory metal third layer over the metallization comprises: depositing the refractory metal third layer by physical vapor deposition.

24. (Withdrawn) The process according to claim 17, wherein forming a refractory metal third layer over the metallization comprises:

sputtering NiV over the refractory metal second layer to a thickness in a range from about 500 Å to about 2,000 Å.

25. (Original) The process according to claim 17, wherein forming a refractory metal fourth layer over the refractory metal first layer comprises:

depositing the refractory metal fourth layer by physical vapor deposition.

26. (Withdrawn) The process according to claim 17, wherein forming a refractory metal fourth layer over the refractory metal first layer comprises:

sputtering NiV over the refractory metal third layer to a thickness in a range from about 1,000 Å to about 4,000 Å.

27. (Withdrawn) A process comprising:

forming a metallization;

sputtering a refractory metal first layer over the metallization;

sputtering a refractory metal second layer over the refractory metal first layer, wherein the refractory metal second layer is a refractory metal alloy;

sputtering a refractory metal third layer above and on the refractory metal second layer, wherein the third refractory metal is substantially the same metal as the refractory metal first layer;

sputtering a refractory metal fourth layer above and on the refractory metal third layer, wherein the refractory metal fourth layer is substantially the same metal as the refractory metal first layer; and

plating a Sn-containing solder through a mask onto the refractory metal fourth layer to form an electrically connective bump.

28. (Withdrawn) The process according to claim 27, further comprising:

etching the first-through-fourth refractory metal layers with an etch recipe that is selective to the solder; and

reflowing the solder.

29. (Withdrawn) The process according to claim 27, further comprising

first anisotropic etching the first-through-fourth refractory metal layers with an etch recipe that is selective to the solder;

second isotropic etching the first-through-fourth refractory metal layers with an etch recipe that is selective to the solder and to the mask; and

reflowing the solder.

30. (Withdrawn) The process according to claim 27, further comprising:

anisotropically etching the mask and the first-through-fourth refractory metal layers by using the bump precursor as a shadow mask; and

etching the first-through-fourth refractory metal layers with an etch recipe that is selective to the solder.

31. (Withdrawn) The process according to claim 17, wherein forming a refractory metal first layer over the metallization includes sputtering Ti over the metallization to a thickness in a range from about 500 Å to about 2,000 Å, and wherein forming a refractory metal second layer over the refractory metal first layer includes sputtering NiV over the refractory metal first layer to a thickness in a range from about 1,000 Å to about 4,000 Å.

32. (Withdrawn) The process according to claim 17, wherein forming a refractory metal first layer over the metallization includes sputtering Ti over the metallization to a thickness in a range from about 500 Å to about 2,000 Å, wherein forming a refractory metal second layer over the refractory metal first layer includes sputtering NiV over the refractory metal first layer to a thickness in a range from about 1,000 Å to about 4,000 Å, and wherein forming a refractory metal third layer over the metallization includes sputtering NiV over the refractory metal second layer to a thickness in a range from about 500 Å to about 2,000 Å.

33. (Withdrawn) The process according to claim 17, wherein forming a refractory metal first layer over the metallization includes sputtering Ti over the metallization to a thickness in a range from about 500 Å to about 2,000 Å, wherein forming a refractory metal second layer over the refractory metal first layer includes sputtering NiV over the refractory metal first layer to a thickness in a range from about 1,000 Å to about 4,000 Å, wherein forming a refractory metal third layer over the metallization includes sputtering NiV over the refractory metal second layer to a thickness in a range from about 500 Å to about 2,000 Å, and wherein forming a refractory metal fourth layer over the refractory metal first layer includes sputtering NiV over the refractory metal third layer to a thickness in a range from about 1,000 Å to about 4,000 Å.

34. (Withdrawn) The process according to claim 17, wherein forming a metallization includes:

forming a copper metallization pad over a substrate, wherein the copper metallization pad makes contact with a metallization selected from a range of metal-one (M1) to M6; and

wherein forming a refractory metal first layer over the metallization includes sputtering Ti over the metallization to a thickness in a range from about 500 Å to about 2,000 Å, wherein forming a refractory metal second layer over the refractory metal first layer includes sputtering NiV over the refractory metal first layer to a thickness in a range from about 1,000 Å to about 4,000 Å, wherein forming a refractory metal third layer over the metallization includes sputtering NiV over the refractory metal second layer to a thickness in a range from about 500 Å to about 2,000 Å, and wherein forming a refractory metal fourth layer over the refractory metal first layer includes sputtering NiV over the refractory metal third layer to a thickness in a range from about 1,000 Å to about 4,000 Å.

35. (Withdrawn) The process according to claim 17, wherein forming a refractory metal first layer over the metallization comprises:

sputtering Ti over the metallization to a thickness in a range from about 500 arbitrary units to about 2,000 arbitrary units.

36. (Withdrawn) The process according to claim 17, wherein forming a refractory metal first layer over the metallization includes sputtering Ti over the metallization to a thickness in a range from about 500 arbitrary units to about 2,000 arbitrary units, and wherein forming a refractory metal second layer over the refractory metal first layer includes sputtering NiV over the refractory metal first layer to a thickness in a range from about 1,000 of the arbirtary units to about 4,000 of the arbirtary units.

37. (Withdrawn) The process according to claim 17, wherein forming a refractory metal first layer over the metallization includes sputtering Ti over the metallization to a thickness in a range from about 500 arbitrary units to about 2,000 arbitrary units, wherein forming a refractory metal

second layer over the refractory metal first layer includes sputtering NiV over the refractory metal first layer to a thickness in a range from about 1,000 of the arbirtary units to about 4,000 of the arbirtary units, and wherein forming a refractory metal third layer over the metallization includes sputtering NiV over the refractory metal second layer to a thickness in a range from about 500 of the arbirtary units to about 2,000 of the arbirtary units.

38. (Withdrawn) The process according to claim 17, wherein forming a refractory metal first layer over the metallization includes sputtering Ti over the metallization to a thickness in a range from about 500 arbitrary units to about 2,000 arbitrary units, wherein forming a refractory metal second layer over the refractory metal first layer includes sputtering NiV over the refractory metal first layer to a thickness in a range from about 1,000 of the arbirtary units to about 4,000 of the arbirtary units, wherein forming a refractory metal third layer over the metallization includes sputtering NiV over the refractory metal second layer to a thickness in a range from about 500 of the arbirtary units to about 2,000 of the arbirtary units, and wherein forming a refractory metal fourth layer over the refractory metal first layer includes sputtering NiV over the refractory metal third layer to a thickness in a range from about 1,000 of the arbitrary units to about 4,000 of the arbitrary units.

39. (Withdrawn) The process according to claim 17, further including:

nitriding at least one of the metal second layer and the metal fourth layer to form a nitrided metal alloy or a nitrided vanadium-doped metal.

40. (Withdrawn) The process according to claim 17, wherein the refractory metal first layer, the refractory metal second layer, the refractory metal third layer, and the refractory metal fourth layer include a four-metal-layer stack, the process further including:

plating a bump precursor over the four-metal-layer stack.

41. (Withdrawn) The process according to claim 17, wherein the refractory metal first layer, the refractory metal second layer, the refractory metal third layer, and the refractory metal fourth layer include a four-metal-layer stack, the process further including:

electroless plating a bump precursor over the four-metal-layer stack.

42. (Withdrawn) The process according to claim 17, wherein the refractory metal first layer, the refractory metal second layer, the refractory metal third layer, and the refractory metal fourth layer include a four-metal-layer stack, the process further including:

plating a bump precursor over the four-metal-layer stack; and

further processing the four-metal-layer stack to remove the four-metal-layer stack except under the bump precursor.

43. (Withdrawn) A process comprising:

forming a metallization;

forming a Ti first layer over the metallization to a thickness in a range from about 500 arbitrary units to about 2,000 arbitrary units;

forming a NiV second layer over the Ti first layer to a thickness in a range from about 1,000 of the arbirtary units to about 4,000 of the arbirtary units;

forming a Ti third layer over the NiV second layer to a thickness in a range from about 500 arbitrary units to about 2,000 arbitrary units; and

forming a NiV fourth layer over the Ti third layer to a thickness in a range from about 500 arbitrary units to about 2,000 arbitrary units.

44. (Withdrawn) The process according to claim 43, wherein the Ti first layer, the NiV second layer, the Ti third layer, and the NiV fourth layer include a four-metal-layer stack, the process further including:

plating a bump precursor over the four-metal-layer stack; and

further processing the four-metal-layer stack to remove the four-metal-layer stack except under the bump precursor.

45. (Withdrawn) The process according to claim 43, further including:

plating a Sn-containing solder through a mask onto the NiV fourth layer to form an electrically connective bump;

etching the first-through-fourth layers with an etch recipe that is selective to the solder; and

reflowing the solder.